

STENARIA SANCHEZII (RUBIACEAE), A NEW AND ENDANGERED SPECIES  
FROM SONORA, MEXICO

David H. Lorence

National Tropical Botanical Garden  
3530 Papalina Road  
Kalaheo, Hawaii 96741, U.S.A.  
lorence@ntbg.org

ABSTRACT

A new species of the North American genus *Stenaria* (Raf.) Terrell is described from Sonora, Mexico. ***Stenaria sanchezii*** is unique in its combination of foliaceous calyx lobes, corollas with a tube c. 9 mm long, and oblong to ellipsoid seeds. Due to its restricted distribution, small population size, and vulnerability to threats from grazing animals and habitat loss, it is considered to be critically endangered (CR) based in IUCN Red List criteria.

KEY WORDS: *Stenaria*, Rubiaceae, Hedyotideae, Spermaceae, Sonora, Mexico, critically endangered, IUCN Red List

RESUMEN

Se describe una nueva especie del género norteamericano *Stenaria* (Raf.) Terrell de Sonora, México. ***Stenaria sanchezii*** Lorence se caracteriza por tener lóbulos de cáliz foliáceos, corolas con un tubo c. 9 mm de largo, y semillas de oblongas a elipsoides. Debido a su distribución muy restringida con solamente dos individuos conocidos, y debido a la vulnerabilidad al ganado y pérdida de hábitat, se considera como en peligro crítico (CR) basado en los criterios de la Lista Roja de IUCN.

During the course of field work in Sonora, Mexico by Jesús Sánchez-Escalante, Richard Felger, and collaborators two collections were made representing a new species of Rubiaceae belonging to the Spermaceae s. lat. (Hedyotideae) tribe. Based on morphological characters it is referable to the genus *Stenaria* and is here described as *Stenaria sanchezii* Lorence. The combination of woody herb or subshrub habit, thin non-leathery leaves, foliaceous calyx lobes tapering to a narrow, attenuate base, and corollas with comparatively long tubes to 9 mm long distinguishes *S. sanchezii* from its congeners.

Based on morphological features this new species belongs to the group of Mexican and North American species in the tribe Hedyotideae, currently included by some authors in Spermaceae s. lat. (Groeninckx et al. 2009). Members of this alliance form a relatively large and taxonomically complex group that is not yet well resolved. Historically, Standley (1918), in his treatment for the North American flora, recognized 48 species which he assigned to either *Houstonia* L. or *Oldenlandia*. Subsequently Lewis (1961, 1962) merged all North American (including Mexican) members of the alliance into *Hedyotis* L. However, *Hedyotis* in the strict sense is an Old World genus ranging from SE Asia to the Caroline Islands of Micronesia with two widespread species in western Polynesia (Church 2003; Terrell et al. 2005). Terrell and Robinson (2003) concluded that the genus is restricted to Asia and the Pacific region with the type species, *Hedyotis fruticosa* L., being from Sri Lanka.

To accommodate North American and Mexican species not referable to *Hedyotis*, *Houstonia*, or *Oldenlandia*, Terrell and collaborators resurrected or described new genera including *Carterella* Terrell, *Oldenlandiopsis* Terrell & W. Lewis, *Stenaria* (Raf.) Terrell, and *Stenotis* Terrell (Terrell 1987, 1990, 1996, 2001a, 2001b; Terrell & Lewis 1990; Terrell & Robinson 2006).

Although generic delimitations in this complex have not been fully resolved, recent morphological and molecular studies are contributing to a greater understanding of the group. Initial studies of nuclear and chloroplast DNA by Church (2003), suggest that the North American *Houstonia* species are not monophyletic but belong to the same lineage as *Stenaria*. The picture is complex, however, with radiations in this lineage accompanied by descending aneuploidy and apparently other characters such as annual versus perennial



habit, heterostylous versus monostylous breeding systems, and evolution of self fertilization, which seem to have originated multiple times (Church 2003). More recent phylogenetic studies of the Hedyotideae s. lat. and Spermacoceae based on chloroplast, plastid, and nuclear DNA regions (Kårehed et al. 2008; Groeninckx, et al. 2009) support *Hedyotis* as being restricted to the Paleotropics and *Houstonia* and *Stenaria* as being American.

Floral, fruit, and seed morphology of this new species indicate it is referable to the group of species which includes *Houstonia nigricans* and related species. These are currently placed in *Stenaria* (Raf.) Terrell, a genus of six species (including this new one) restricted to Mexico and the southwestern United States (Terrell 2001a). The phylogenies of Kårehed et al. (2008: 850) and Groeninckx et al. (2009: 118) based on plastid DNA data place *Stenaria nigricans* (Lam.) Terrell in the *Arcytophyllum-Houstonia* clade.

Until the generic delimitations of this complex group are more clearly resolved, it was decided to place the new species in *Stenaria*. Based on its woody perennial habit, thin textured leaf blades, and subglobose capsules, *Stenaria sanchezii* seems closest to *S. nigricans*, which differs in having shorter corollas 2–8.5 mm long with tubes (1.5–)2–4(–5.5) mm long (Terrell 2001a). Corollas are much longer in the new species, although only two mature corollas were available for study. The foliaceous calyx lobes tapering to a narrowly attenuate base in *S. sanchezii* are also very distinctive and in combination with the other characters readily separate it from its congeners.

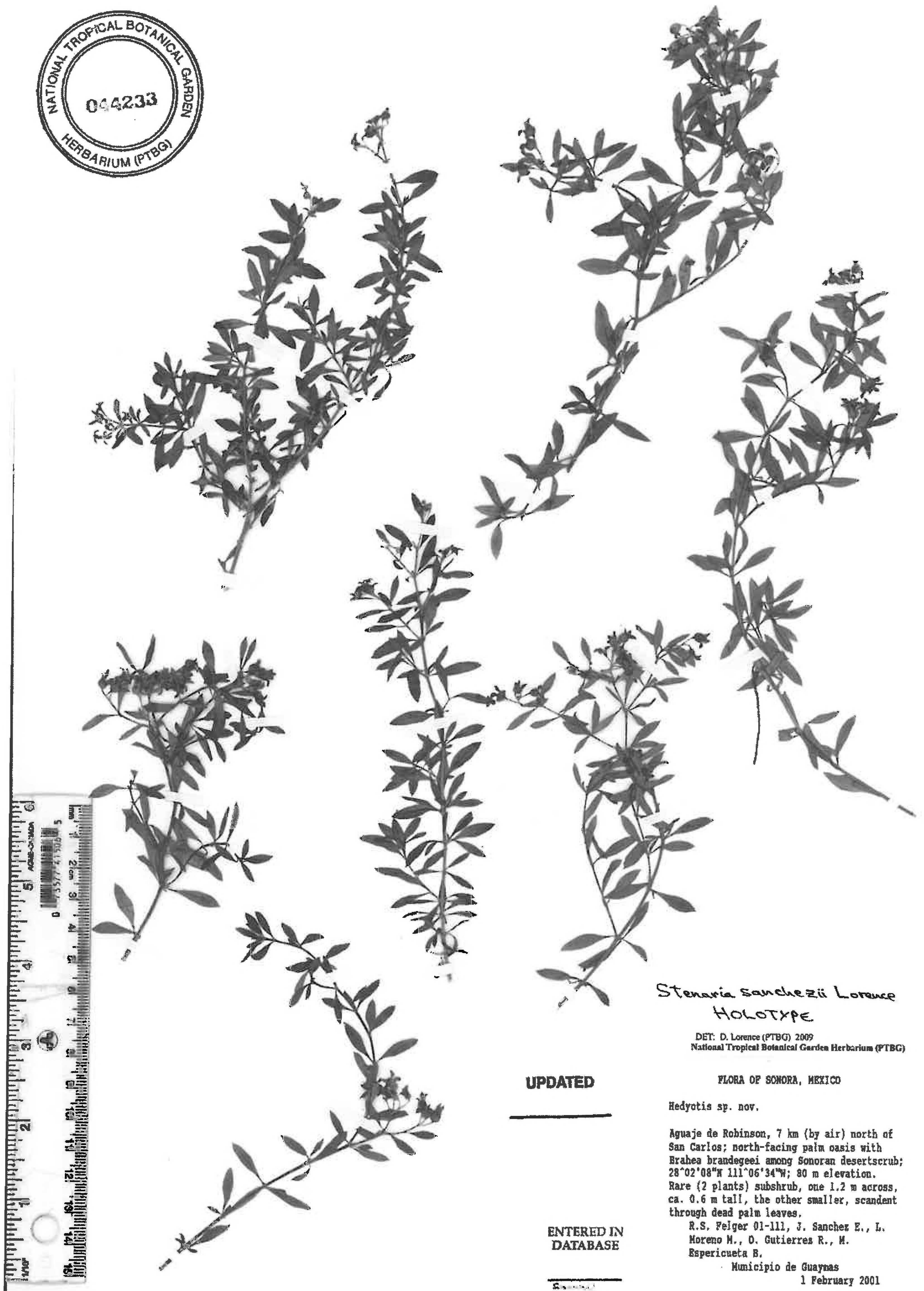
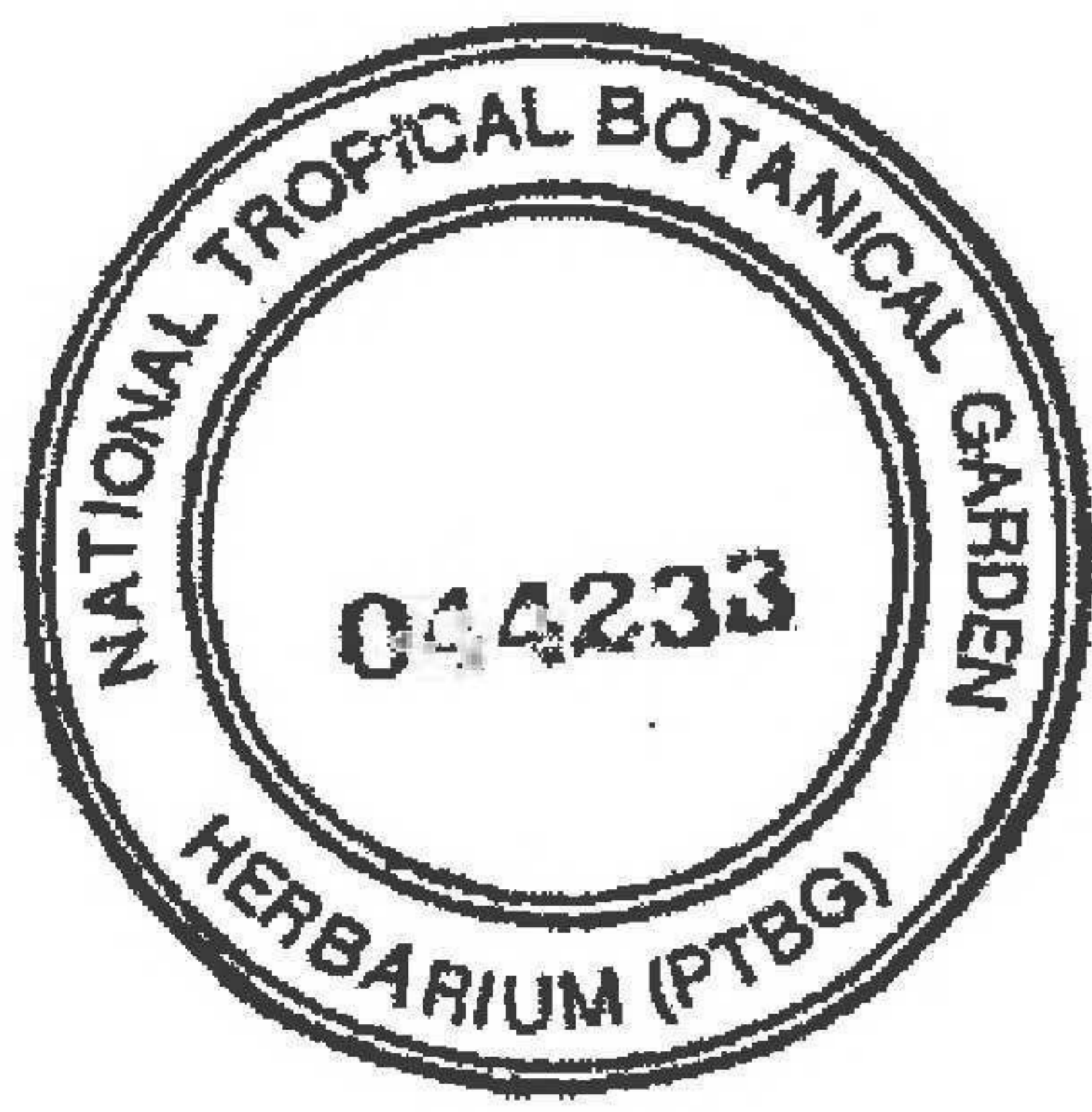
***Stenaria sanchezii*** Lorence, sp. nov. (**Fig. 1**). TYPE: MEXICO. SONORA: Municipio de Guaymas, Aguaje de Robinson, 7 km (by air) north of San Carlos; 28°2'8"N, 111°6'34"W, 80 m, 1 Feb 2001, R.S. Felger, J.J. Sánchez-Escalante, L. Moreno-Moreno, O. Gutiérrez-Rochín, & M. Espericueta-Betancourt 01-111 (HOLOTYPE: PTBG 44233; ISOTYPES: ARIZ, USON).

Species *Stenariae nigricante* (Lam.) Terrell affinis, floribus lobis calycinis foliaceis anguste oblanceolatis attenuatis, 3–3.5 mm longis, 0.5–0.8 mm latis, corolla longiore tubo ad 9 mm longo differt.

Woody perennial *herbs* or *subshrubs* 20–60 cm tall, spreading to 120 cm across, basal *stems* woody, 2.5–3 mm in diam., bark pale brown, exfoliating, *leafy twigs* 0.4–0.8 mm diam., densely hirtellous-puberulent with short white trichomes to 0.1 mm long. *Leaves* opposite, sometimes pseudoverticillate with 1–2 smaller leaf pairs in axils, petiolate; petioles 1–3 mm long, 0.15–0.3 mm diam., winged distally, adaxially flattened, minutely puberulent; blades oblanceolate to oblong-elliptic, base cuneate, attenuate and decurrent along petiole, apex abruptly short acuminate to apiculate, thinly chartaceous, both surfaces minutely puberulent when young on costa and margins toward base, glabrescent, venation inconspicuous, secondary veins 3–5 per side, eucamptodromous, higher order venation loosely reticulate; *stipules* interpetiolar, narrowly triangular, sheath 0.2–0.3 mm long, body c. 1 mm long, apex slender, glandular-tipped, margins with 2–4 gland-tipped setae. *Inflorescences* terminal, monochasial, corymbiform, 3–5-flowered, axes puberulent, pedicels 1–4.5 × 0.2 mm, bracteoles subulate or fimbriate, 0.3–0.7 mm long; *flowers* apparently hermaphroditic; *short-styled flowers* with hypanthium broadly ellipsoid-compressed, 0.8–1 mm long and wide, sparsely puberulent, 8-ribbed; calyx tube lacking, calyx lobes 4, equal or subequal, narrowly oblanceolate, 3–3.5 × 0.5–0.8 mm, tapering to narrow base 0.5–0.6 mm wide, apex acuminate, glabrous, venose; *corolla* in bud (possibly not fully expanded) 10 mm long including the lobes, obtuse, at anthesis tube 9 mm long, 0.8 mm wide medially and 1.3 mm wide distally, lobes 4, narrowly ovate-oblong, 2–2.5 × 1–1.1 mm, acute; *stamens* 4, attached just below mouth of tube, subsessile, anthers ellipsoid, 1–1.2 mm long, tips exerted; style included, 6 mm long, puberulent in basal 1/3, stigma 0.8 mm long, slightly bilobed; *long-styled flowers* not seen. *Capsules* 2–3 × 2–2.8 mm, subglobose, dehiscence loculicidal, containing numerous seeds; calyx lobes persistent, 3.5–4 × 1.4–1.5 mm; *seeds* (possibly not fully mature) non-crateriform, moderately compressed, with punctiform hilum, oblong to ellipsoid or broadly ellipsoid, 0.6–0.8 × 0.3–0.5 mm, testa foveolate-reticulate, dark brown.

*Etymology*.—This new species is named for its first collector, J. Jesús Sánchez-Escalante, Curator of Herbario de la Universidad de Sonora (USON) and founder of the Asociación para las Plantas Nativas de Sonora, A.C. in Hermosillo, in recognition of his efforts to develop USON as a major botanical resource in northwestern México to study and conserve the flora of Sonora, and to inspire young biologists to study plants.





*Stenaria sanchezii* Lorence  
HOLOTYPE

DET: D. Lorence (PTBG) 2009  
National Tropical Botanical Garden Herbarium (PTBG)

UPDATED

FLORA OF SONORA, MEXICO

*Hedyotis* sp. nov.

Aguaje de Robinson, 7 km (by air) north of San Carlos; north-facing palm oasis with *Brahea brandegeei* among Sonoran desertscrub; 28°02'08"N 111°06'34"W; 80 m elevation. Rare (2 plants) subshrub, one 1.2 m across, ca. 0.6 m tall, the other smaller, scandent through dead palm leaves.

R.S. Felger 01-111, J. Sanchez E., L. Moreno M., O. Gutierrez R., M. Espericueta B.

Municipio de Guaymas

1 February 2001

ENTERED IN  
DATABASE

FIG. 1. Holotype of *Stenaria sanchezii* Lorence (Felger et al. 01-111, PTBG).



*Distribution and habitat.*—Known only from the type locality in Sonora. This new species is extremely rare and localized in microhabitats on slopes on the north side of the Sierra El Aguaje. The general vegetation is desert scrub in the Central Gulf Coast subdivision of the Sonoran Desert (Shreve 1964). Felger's (1999) flora of Nacapule in the southeastern Sierra El Aguaje provides a good general description of the vegetation and associated species. *Stenaria sanchezii* occurs on rocky substrate in a shady canyon bottom and also in a north-facing palm oasis with *Brahea brandegeei* (Purpus) H. E. Moore and *Ficus petiolaris* (Kunth) subsp. *palmeri* (S. Watson) Felger. Four to five plants were seen in 2000, but only two plants were observed at the same locality in 2001. The area is heavily grazed by cattle, a primary threat to this new species.

*Conservation status.*—When evaluated using the IUCN criteria for endangerment (IUCN 2001, see also [www.iucnredlist.org/info/categories\\_criteria2001](http://www.iucnredlist.org/info/categories_criteria2001)), *Stenaria sanchezii* falls into the Critically Endangered (CR) category, which designates species facing the highest risk of extinction in the wild. IUCN Red List Category: **Critically Endangered** (CR; B1a; B2a, B2b i–iii): B1, extent of occurrence estimated to be less than 100 km<sup>2</sup>, and B1a, known to exist at only a single location. B2, area of occupancy estimated to be less than 10 km<sup>2</sup>, and B2a, a single population known. B2b (i–iii), habitat continuing decline inferred. The suitable habitat for *S. sanchezii* at a single locality is indicated as an endangered environment, threatened by human activity (firewood harvesting and fire), grazing, and invasive plants, reducing the extent of the Sonoran desert scrub habitat.

PARATYPE: **MEXICO. SONORA:** Municipio de Guaymas, Aguaje de Robinson, 7 km (by air) N of San Carlos, 28°2'8"N, 111°6'34"W, 80 m, 2 Mar 2000, J. Sanchez, L. Moreno, M. Espericueta s.n. (PTBG 44234, USON).

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#### REFERENCES

- CHURCH, S.A. 2003. Molecular phylogenetics of *Houstonia* (Rubiaceae): descending aneuploidy and breeding system evolution in the radiation of the lineage across North America. *Molec. Phylogen. Evol.* 27:223–238.
- FELGER, R.S. 1999. Flora of Cañón Nacapule: a desert-bounded tropical canyon near Guaymas, Sonora. *Proc. San Diego Soc. Nat. History* 35:1–42.
- GROENINCKX, I., S. DESSEIN, H. OCHOTERENA, C. PERSSON, T.J. MOTLEY, J. KÅREHED, B. BREMER, S. HUYSMANS, AND E. SMETS. 2009. Phylogeny of the herbaceous Tribe Spermaceae (Rubiaceae) based on plastid DNA data. 2009. *Ann. Missouri Bot. Gard.* 96:109–132.
- KÅREHED, J., I. GROENINCKX, S. DESSEIN, T.J. MOTLEY, AND B. BREMER. 2008. The phylogenetic unity of chloroplast and nuclear DNA markers and the phylogeny of the Rubiaceae tribe Spermaceae. *Molec. Phylogen. Evol.* 49:843–866.
- LEWIS, W.H. 1961. Merger of the North American *Houstonia* and *Oldenlandia* under *Hedyotis*. *Rhodora* 63: 216–223.
- LEWIS, W.H. 1962. Phylogenetic study of *Hedyotis* (Rubiaceae) in North America. *Amer. J. Bot.* 49:855–865.
- SHREVE, F. 1964. Vegetation of the Sonoran Desert. In: F. Shreve and I.L. Wiggins. *Vegetation and flora of the Sonoran Desert*. Stanford Univ. Press, Stanford, CA. Pp. 9–186.
- STANDLEY, P.C. 1918. Rubiaceae (pars). *North American Flora* 32(1):1–86.
- TERRELL, E.E. 1987. *Carterella* (Rubiaceae), a new genus from Baja California, Mexico. *Brittonia* 39:248–252.
- TERRELL, E.E. 1990. Synopsis of *Oldenlandia* (Rubiaceae) in the United States. *Phytologia* 68:125–133.
- TERRELL, E.E. 1996. Revision of *Houstonia* (Rubiaceae-Hedyotideae). *Syst. Bot. Monogr.* 48:1–118.
- TERRELL, E.E. 2001a. Taxonomy of *Stenaria* (Rubiaceae: Hedyotideae), a new genus including *Hedyotis nigricans*. *Sida* 19:591–614.



- TERRELL, E.E. 2001b. *Stenotis* (Rubiaceae), a new segregate genus from Baja California, Mexico. *Sida* 19:899–911.
- TERRELL, E.E. AND W.H. LEWIS. 1990. *Oldenlandiopsis* (Rubiaceae), a new genus from the Caribbean Basin, based on *Oldenlandia callitrichoides* Grisebach. *Brittonia* 42:185–190.
- TERRELL, E.E. AND H. ROBINSON. 2003. Survey of Asian and Pacific species of *Hedyotis* and *Exallage* (Rubiaceae) with nomenclatural notes on *Hedyotis* types. *Taxon* 52:775–782.
- TERRELL, E.E., H.E. ROBINSON, W.L. WAGNER, AND D.H. LORENCE. 2005. Resurrection of genus *Kadua* for Hawaiian Hedyotidinae (Rubiaceae), with emphasis on seed and capsule characters and notes on South Pacific species. *Syst. Bot.* 30:818–833.
- TERRELL, E.E. AND H. ROBINSON. 2006. Taxonomy of North American species of *Oldenlandia* (Rubiaceae). *Sida* 22:305–329.